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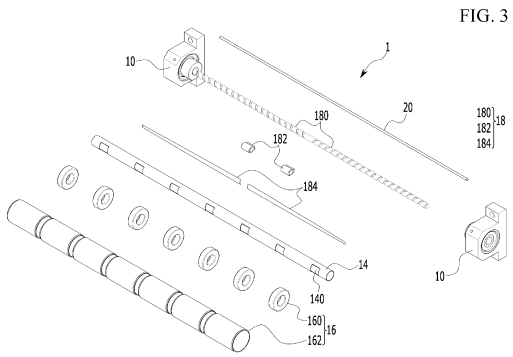
(54) ROLLER FOR SUPPORTING MATERIALS

(57) A roller for supporting a material according to an embodiment of the present invention includes: a rotation shaft; a pipe having a space in which the rotation shaft is inserted; a deforming part that is connected to the rotation shaft and the pipe to deform the pipe; and a support part that is installed at the pipe to support the material. The deforming part includes: a thread portion provided on the rotation shaft; a nut part screwed to the thread portion; an inclined part that is disposed at an inner surface of the pipe and that is pressed by the nut part according to rotation of the rotation shaft; and a driving source that is connected to the rotation shaft to rotate the rotation shaft.

FIG. 3



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Description

[Technical Field]

Cross-reference to related application(s)

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2021-0149599 filed in the Korean Intellectual Property Office on November 3, 2021, the entire contents of which are incorporated herein by reference.

[0002] The present invention relates to a roller for supporting a material, and more specifically, to a roller for supporting a material of a thin film.

[Background Art]

[0003] As technology development and demand for mobile devices increase, demand for a secondary battery as an energy source is rapidly increasing. In particular, the secondary battery is attracting much attention as an energy source not only for a mobile device such as a mobile phone, a digital camera, a laptop computer, a wearable device, or the like, but also for a power device such as an electric bicycle, an electric vehicle, a hybrid electric vehicle, or the like.

[0004] The secondary battery may be formed by inserting an electrode assembly including a positive electrode, a negative electrode, and a separator in a case and then sealing the case. For example, the positive electrode, the negative electrode, and the separator are manufactured through a roll-to-roll manufacturing process using their own thin materials.

[0005] The thin film material is usually formed in a form of a sheet during the manufacturing process, the sheet is supported by a roller, and the roller needs to support the thin film material so that deformation such as a wrinkle does not occur in the thin film material during the manufacturing process.

[0006] This demand is also applied to another material (e.g., a film or a PET film) that is manufactured into a product desired by a consumer using a roll-to-roll method.

[Disclosure]

[Technical Problem]

[0007] An object to be solved by the present invention is to provide a roller for supporting a material capable of preventing an error phenomenon such as a wrinkle in the material while supporting the material during a manufacturing process.

[0008] A problem to be solved by the present invention is not limited to the above-described problem, and problems not mentioned will be clearly understood by a person of ordinary skill in the art from the present specification and the accompanying drawings.

[Technical Solution]

[0009] A roller for supporting a material according to an embodiment of the present invention includes: a rotation shaft; a pipe having a space in which the rotation shaft is inserted; a deforming part that is connected to the rotation shaft and the pipe to deform the pipe; and a support part that is installed at the pipe to support the material. The deforming part includes: a thread portion provided on the rotation shaft; a nut part screwed to the thread portion; an inclined part that is disposed at an inner surface of the pipe and that is pressed by the nut part according to rotation of the rotation shaft; and a driving source that is connected to the rotation shaft to rotate the rotation shaft.

[0010] The thread portion may include a left thread portion and a right thread portion, the nut part may be provided as a pair of nut parts disposed at an arbitrary interval at the left thread portion and the right thread portion, and the inclined part may be provided as a pair of inclined parts to correspond to the pair of nut parts, respectively.

[0011] The pair of nut parts may be connected to a guide shaft disposed parallel to the rotation shaft.

[0012] The pair of inclined parts may have a shape that becomes inclined from a periphery portion of the pipe to a center portion of the pipe.

[0013] In addition, the pair of inclined parts may have a shape that becomes thick from the periphery portion of the pipe to the center portion of the pipe.

[0014] The pair of nut parts may move from the periphery portion of the pipe to the center portion of the pipe according to the rotation of the rotation shaft to press the inclined part.

[0015] The pipe may be convexly deformed by pressurization of the inclined part in a direction in which the inclined part is positioned.

[0016] The support part may include a bobbin coupled to a bearing installed at the pipe, and the bobbin may be installed in a plurality at the pipe.

[0017] The material may be an electrode or a separator of a secondary battery.

[Advantageous Effects]

[0018] According to embodiments, a roller can be varied and a degree of variation is also adjustable.

[0019] Accordingly, the roller according to an embodiment may flexibly support a material according to a characteristic of the material to be supported, and the material may be manufactured as a quality product while preventing an abnormality such as a wrinkle during a manufacturing process.

[0020] An effect of the present invention is not limited to the above-described effects, and effects not mentioned will be clearly understood by a person of ordinary skill in the art from the present specification and the accompanying drawings.

[Description of the Drawings]

[0021]

FIG. 1 is a plan view illustrating a roller according to an embodiment of the present invention.
FIG. 2 is a perspective view illustrating the roller according to an embodiment of the present invention.
FIG. 3 is an exploded perspective view illustrating the roller of FIG. 2.
FIG. 4 is a partially cut-away perspective view of the roller of FIG. 2.
FIGS. 5A and 5B are views illustrating an operation state of the roller according to an embodiment of the present invention.

[Mode for Invention]

[0022] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present invention.

[0023] Parts that are irrelevant to the description are omitted in the drawings for clear description of the present invention, and like reference numerals designate like elements throughout the specification.

[0024] Further, the size and thickness of the elements shown in the drawings are arbitrarily illustrated for better understanding and ease of description, and the present invention is not necessarily limited thereto. In the drawings, the thickness of layers, films, panels, regions, etc., are exaggerated for clarity. In the drawings, for convenience of description, the thickness of layers, films, panels, areas, etc., are exaggerated.

[0025] Unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising" will be understood to imply the inclusion of stated elements but not the exclusion of any other elements.

[0026] The phrase "in a plan view" or "on a plane" means viewing a target portion from the top, and the phrase "in a cross-sectional view" or "on a cross-section" means viewing a cross-section formed by vertically cutting a target portion from the side.

[0027] FIG. 1 is a plan view illustrating a roller 1 for supporting a material according to an embodiment of the present invention. The roller 1 is disposed at one side of the material 3 (for example, below the material 3) conveyed (transferred) along one direction (e.g., a direction of an arrow in FIG. 1) to support the material 3.

[0028] The roller 1 according to the embodiment is varied so that it is configured to support the material 3. For example, the roller 1 is configured to adjust a degree of variation according to a characteristic of the material 3. For example, the material 3 may be an electrode or a separator for an electrode assembly of a secondary battery, but the material of the present invention is not limited thereto.

[0029] FIG. 2 is a perspective view illustrating the roller 1 according to an embodiment of the present invention, and FIG. 3 is an exploded perspective view of the roller 1.

[0030] As shown in FIGS. 2 and 3, the roller 1 includes a rotation shaft 12 that is rotatably installed at both of holders 10 disposed at regular intervals and a cylindrical pipe 14 disposed at the outside of the rotation shaft 12 while surrounding the rotation shaft.

[0031] The pipe 14 may have a space for inserting the rotation shaft 12 and both ends of the pipe 14 may be fixed to the holders 10. In a state where the rotation shaft 12 is inserted in an inner space of the pipe 14, a predetermined interval is set between an inner circumferential surface of the pipe 14 and an outer circumferential surface of the rotation shaft 12, and incisions 140 of a predetermined size may be disposed at equal intervals along a length direction of the pipe 14.

[0032] In addition, the roller 1 according to the embodiment includes a support part 16 installed at the pipe 14 to support the material 3 and a deforming part 18 connected to the rotation shaft 12 and the pipe 14 to deform the pipe 14.

[0033] In the present embodiment, the support part 16 includes a bobbin 162 that is coupled to a bearing 160 installed at the pipe 14 so that it can be rotated. A plurality of bobbins 162 (for example, seven bobbins) may be installed at the pipe 14.

[0034] The deforming part 18 includes a thread portion 180 provided on the rotation shaft 12 and a nut part 182 that is screwed to the thread portion 180 so that it can be moved along a length direction of the rotation shaft 12 according to rotation of the rotation shaft 12.

[0035] In the present embodiment, the thread portion 180 includes left and right thread portions, and the nut part 182 includes a pair of nut parts respectively screwed to the left thread portion and the right thread portion. The pair of nut parts 182 may move toward a center portion of the rotation shaft 12 when the rotation shaft 12 rotates in one direction, and the pair of nut parts 182 may move toward a periphery portion of the rotation shaft 12 when the rotation shaft rotates in a direction opposite to the one direction.

[0036] Referring to FIG. 4, the nut parts 182 may be connected to a guide shaft 20 having both ends respectively fixed to the holder 10 so that the nut parts performs the above movement while being guided by the guide shaft 20.

[0037] In addition, the deforming part 18 includes an inclined part 184 disposed at an inner surface of the pipe 14 and a driving source 186 (e.g., a driving motor of FIG. 1) connected to the rotation shaft 12 to drive the rotation shaft 12.

[0038] In the present embodiment, the inclined part 184 may be provided as a pair to correspond to the nut portion 182, and the pair of inclined parts may be fixedly

installed at an inner surface of the pipe 14 at an arbitrary interval. One surface (e.g., a surface facing the nut part) of the inclined part 184 may be flat, while the other surface (e.g., a surface facing the inner surface of the pipe) facing the one surface may be curved according to an inner curvature of the pipe 14. The inclined part 184 may have a shape in which its thickness and width decrease from one end to the other end. When the inclined part 184 is disposed on the inner surface of the pipe 14, for example, a thickness of the inclined part 184 becomes thick from a periphery portion of the pipe 14 to a center portion of the pipe 14. Thus, the inclined part 184 becomes inclined from the periphery portion of the pipe 14 to the center portion of the pipe 14.

[0039] Accordingly, when the rotation shaft 12 is rotated by the driving motor that is the driving source 186 in a state shown in FIG. 5A, the pair of nut parts 182 may respectively move to the center portion of the rotation shaft 12 due to a screw coupling relationship with the left and right thread portions 180 to contact the inclined part 184 so that the pair of nut parts 182 press the inclined part 184.

[0040] When the inclined part 184 is pressed, the inclined part 184 is pushed to the outside of the pipe 14 so that the pipe 14 is deformed. As a result, the pipe 14 is convexly deformed in a direction in which the inclined part 184 is disposed. By this deformation, the bobbin 162, which is the support part 16, may also be deformed from its initial position so that the bobbin gives more tension to the material 3 supported by the bobbin. For example, as shown in FIG. 5B, as the nut part 182 moves toward a center (a right side of FIG. 5B), the pipe 14 may be deformed to become convex to one side (an upper side of FIG. 5B). Accordingly, a degree of tension may increase as the nut part 182 moves closer to the center portion of the pipe 14.

[0041] Thus, the roller 1 according to the present embodiment may adjust the degree of tension applied to the material 3 by the support part 16 by deforming the pipe 14 using the deforming part 18 as necessary during a manufacturing process.

[0042] Therefore, in a process in which the roller 1 according to the present embodiment is applied, the material 3 may be supported by adjusting a tension to match a characteristic of the material 3 according to a property of the material 3. Thus, a defect phenomenon such as a wrinkle may be prevented so that the material 3 is manufactured as a product of good quality.

[0043] While this invention has been described in connection with what is presently considered to be practical embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. On the contrary, it is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

<Description of symbols>

[0044]

1:	roller
12:	rotation shaft
14:	pipe
16:	support part
18:	deforming part
20:	guide shaft
160:	bearing
162:	bobbin
180:	thread portion
182:	nut part
184:	inclined part
186:	driving source

Claims

1. A roller for supporting a material, comprising:

a rotation shaft;
a pipe having a space in which the rotation shaft is inserted;
a deforming part that is connected to the rotation shaft and the pipe to deform the pipe; and
a support part that is installed at the pipe to support the material,
wherein the deforming part comprises:

a thread portion provided on the rotation shaft;
a nut part screwed to the thread portion;
an inclined part that is disposed at an inner surface of the pipe and that is pressed by the nut part according to rotation of the rotation shaft; and
a driving source that is connected to the rotation shaft to rotate the rotation shaft.

2. The roller of claim 1, wherein the thread portion includes a left thread portion and a right thread portion, the nut part is provided as a pair of nut parts disposed at an arbitrary interval at the left thread portion and the right thread portion, and the inclined part is provided as a pair of inclined parts to correspond to the pair of nut parts, respectively.

3. The roller of claim 2, wherein the pair of nut parts are connected to a guide shaft disposed parallel to the rotation shaft.

4. The roller of claim 2, wherein the pair of inclined parts become inclined from a periphery portion of the pipe to a center portion of the pipe.

5. The roller of claim 4, wherein the pair of inclined parts

become thick from the periphery portion of the pipe to the center portion of the pipe.

6. The roller of claim 5, wherein the pair of nut parts move from the periphery portion of the pipe to the center portion of the pipe according to the rotation of the rotation shaft to press the inclined part.

7. The roller of claim 6, wherein the pipe is convexly deformed by pressurization of the inclined part in a direction in which the inclined part is positioned.

8. The roller of claim 1, wherein the support part includes a bobbin coupled to a bearing installed at the pipe.

9. The roller of claim 8, wherein the bobbin is installed in a plurality at the pipe.

10. The roller of claim 1, wherein the material is an electrode or a separator of a secondary battery.

FIG. 1

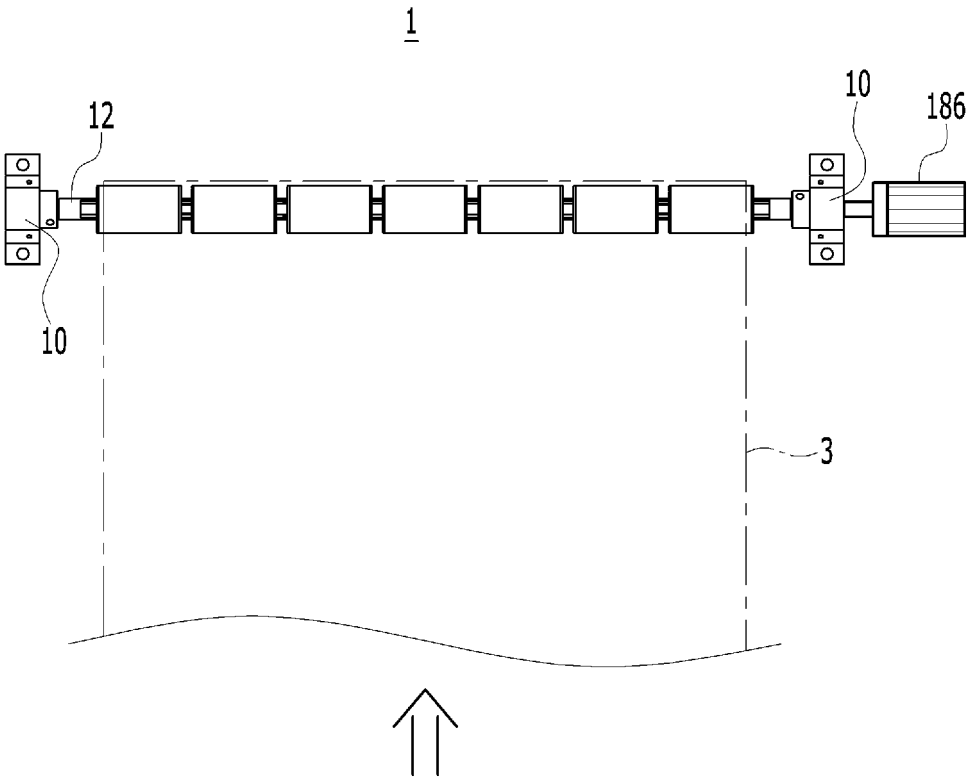


FIG. 2

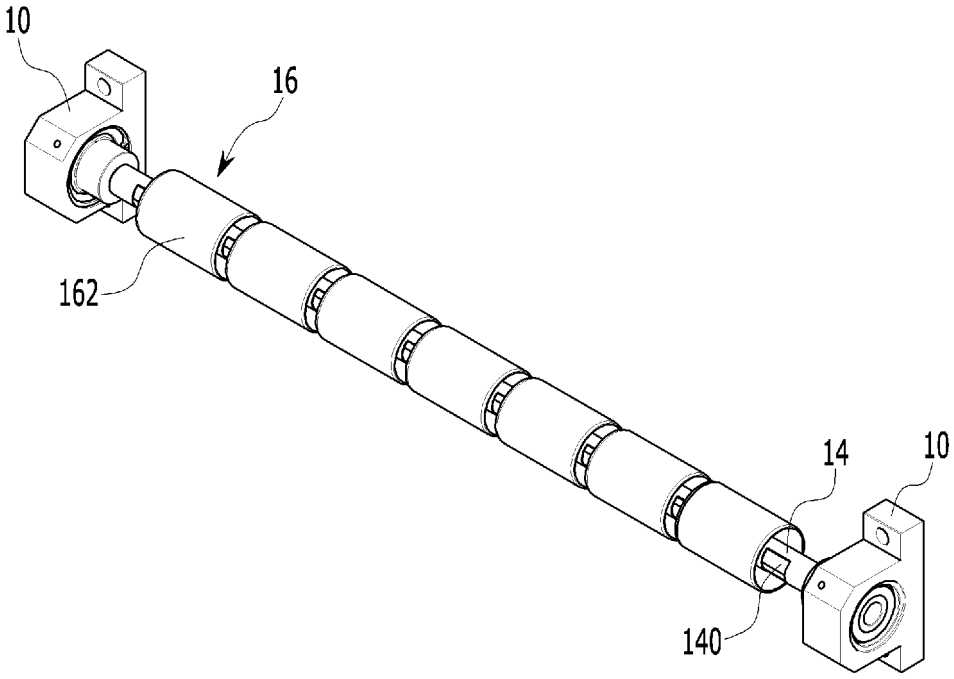


FIG. 3

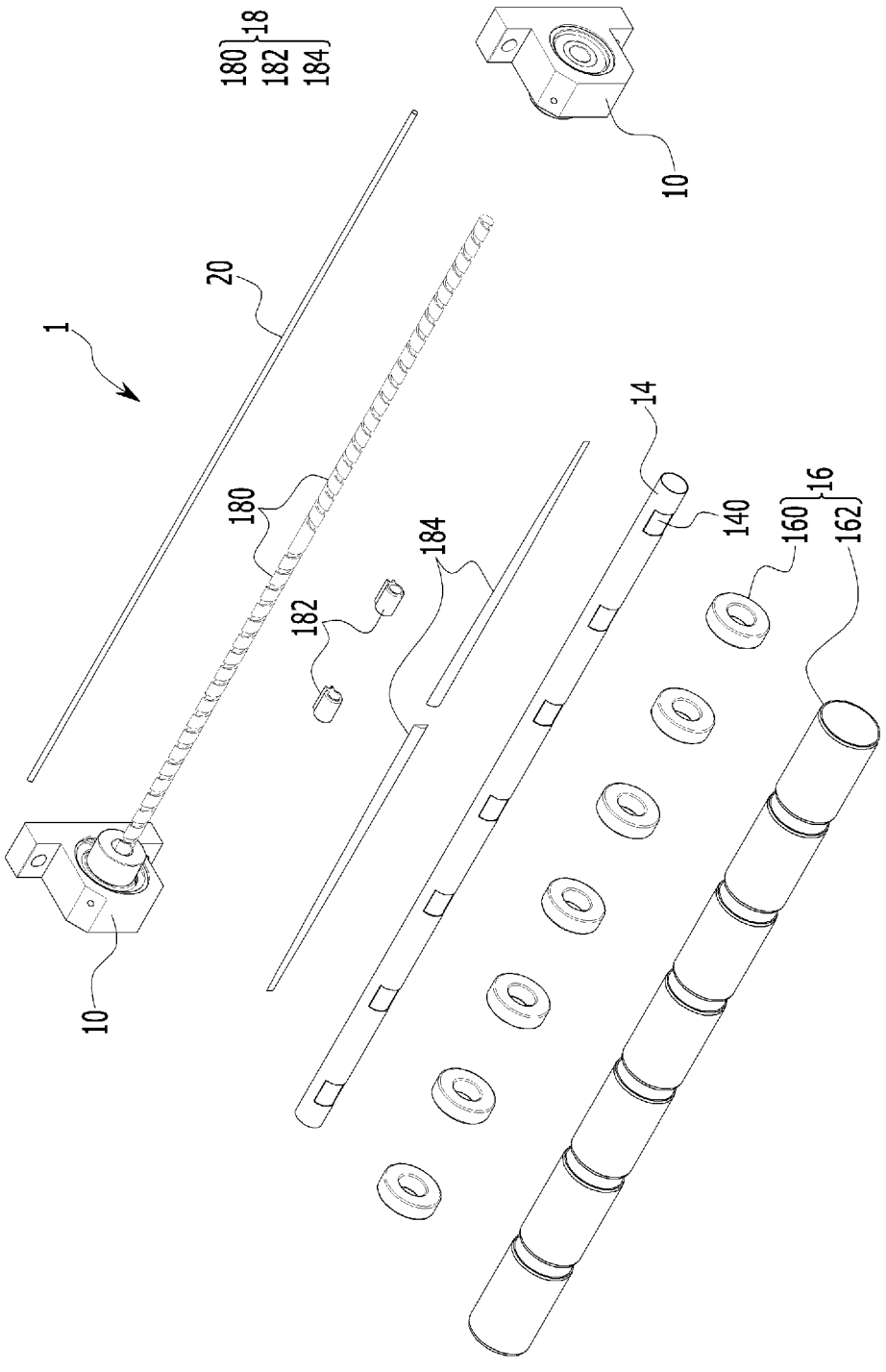


FIG. 4

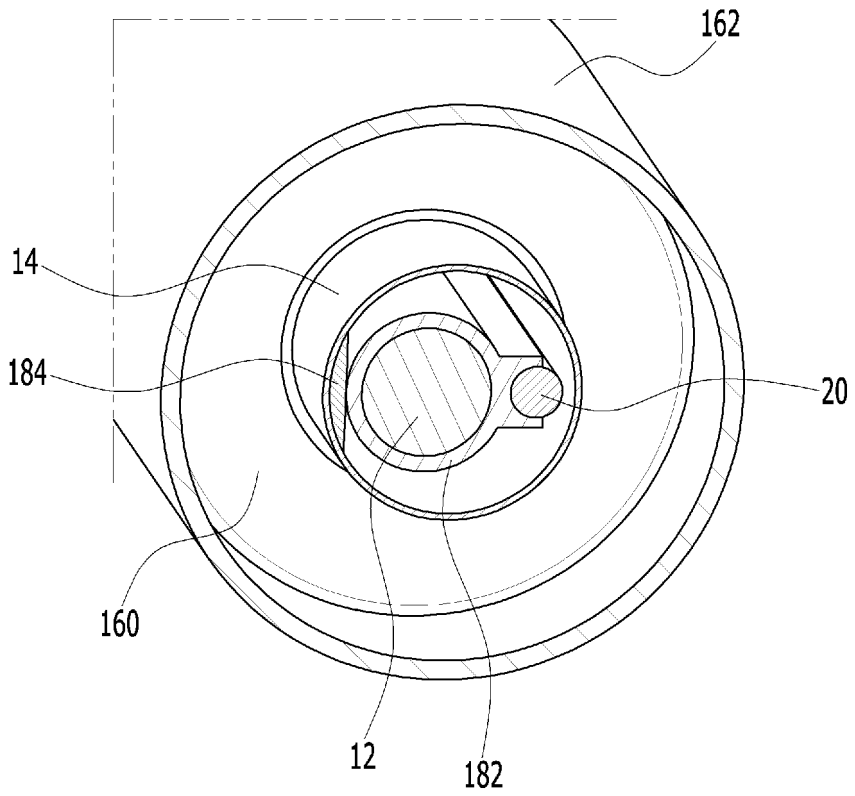


FIG. 5A

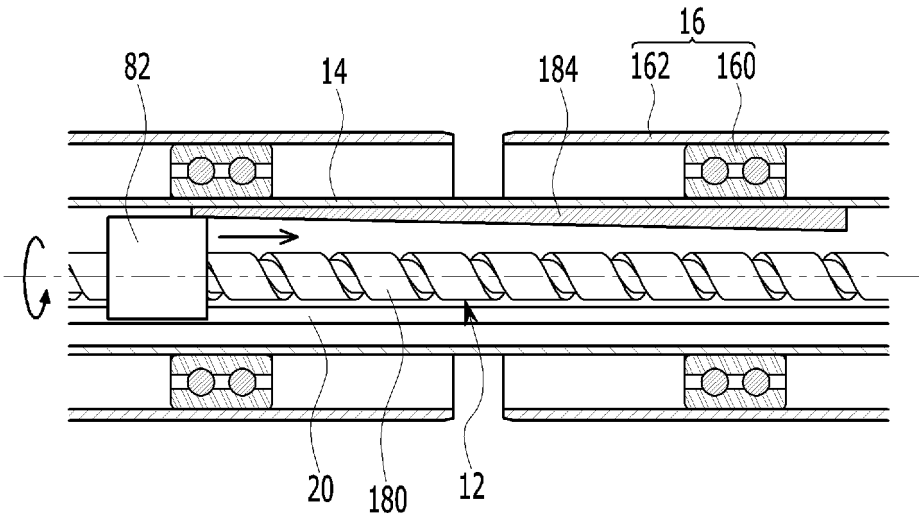
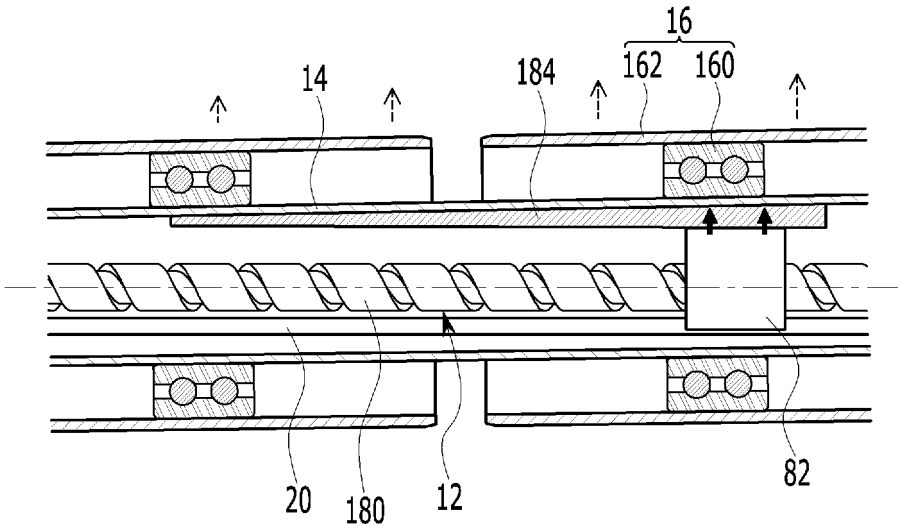


FIG. 5B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/015444

A. CLASSIFICATION OF SUBJECT MATTER

B65H 23/34(2006.01)i; **B65H 23/26**(2006.01)i; **B65H 23/025**(2006.01)i; **H01M 10/04**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H 23/34(2006.01); B02C 11/08(2006.01); B30B 3/00(2006.01); B65G 39/02(2006.01); B65H 20/00(2006.01); B65H 27/00(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 회전축(rotary shaft), 파이프(pipe), 변형기(deforming device), 나사부(threaded portion), 너트부(nut), 경사부(wedge portion), 롤러(roller)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2001-0002381 A1 (KARVONEN et al.) 31 May 2001 (2001-05-31) See paragraphs [0001] and [0011]-[0015] and figures 1-4.	1-10
Y	US 5522785 A (KEDL et al.) 04 June 1996 (1996-06-04) See column 4, lines 1-53 and figures 1-4.	1-10
A	US 4253392 A (BRANDON et al.) 03 March 1981 (1981-03-03) See figures 2A-2B.	1-10
A	US 6524227 B1 (ISOMETSA et al.) 25 February 2003 (2003-02-25) See figure 8.	1-10
A	CN 108946038 A (RUIAN CHUANGBO MACHINERY CO., LTD.) 07 December 2018 (2018-12-07) See claim 1 and figures 1-2.	1-10

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 January 2023	**20 January 2023**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/015444

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
US 2001-0002381 A1	31 May 2001	AT 222211 T	15 August 2002
		AU 4869497 A	29 May 1998
		DE 69714757 T2	03 April 2003
		EP 0937005 A1	25 August 1999
		EP 0937005 B1	14 August 2002
		FI 2788 U1	10 March 1997
		US 6409643 B2	25 June 2002
		WO 98-19949 A1	14 May 1998
US 5522785 A	04 June 1996	None	
US 4253392 A	03 March 1981	CA 1119243 A	02 March 1982
		EP 0017092 A1	15 October 1980
		EP 0017092 B1	24 March 1982
		JP 55-156974 A	06 December 1980
		JP 58-040184 B2	03 September 1983
US 6524227 B1	25 February 2003	AT 374889 T	15 October 2007
		AU 8733698 A	08 March 1999
		CA 2301276 A1	25 February 1999
		CA 2301276 C	27 November 2007
		DE 69838504 T2	24 April 2008
		EP 1003980 A1	31 May 2000
		EP 1003980 B1	03 October 2007
		FI 103071 B1	15 April 1999
		FI 980071 A	20 February 1999
		JP 2001-515192 A	18 September 2001
		JP 4077153 B2	16 April 2008
		WO 99-09329 A1	25 February 1999
CN 108946038 A	07 December 2018	None	

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020210149599 **[0001]**